This listing of claims will replace all previous listings of claims in the application.

Listing of Claims

1. (Twice amended): A method of isolating a nucleic acid from a sample comprising:

a) providing a solid phase comprising:

a solid support portion comprising a matrix selected from silica, glass, insoluble synthetic polymers, and insoluble polysaccharides,

a nucleic acid binding portion for attracting and non-sequence specific binding of nucleic acids, wherein the nucleic acid binding portion of the solid phase is selected from a ternary sulfonium group of the formula $SR_2^+ X^-$ where R is selected from C_1-C_{20} alkyl, aralkyl and aryl groups, a quaternary ammonium group of the formula $NR_3^+ X^-$ wherein R is selected from C_4-C_{20} alkyl, aralkyl and aryl groups, and a quaternary phosphonium group $PR_3^+ X^-$ wherein R is selected from C_1-C_{20} alkyl, aralkyl and aryl groups, and wherein X is an anion. and

a cleavable linker portion linking the nucleic acid binding portion to the solid support;

b) combining the solid phase with the sample containing the nucleic acid to bind the nucleic acid to the solid phase;

c) separating the sample from the solid phase;

d) cleaving the cleavable linker; and thereby

e) releasing the nucleic acid from the solid phase.

2. (Previously Presented): The method of claim 1 wherein the nucleic acid binding portion of the solid phase is selected from a ternary sulfonium group of the formula $SR_2^+ X^-$ where R is selected from C_1-C_{20} alkyl, aralkyl and aryl groups, a quaternary ammonium group of the formula $NR_3^+ X^-$ wherein R is selected from C_4-C_{20} alkyl, aralkyl and aryl groups, and a quaternary phosphonium group $PR_3^+ X^-$ wherein R is selected from C_1-C_{20} alkyl, aralkyl and aryl groups, and wherein X is an anion. cleaving the linker thereby separates the nucleic acid from the solid phase.

3. (Previously Presented): The method of claim 1 wherein the nucleic acid binding portion is a quaternary ammonium group and the R groups each contain from 4-20 carbon atoms.

4. (Previously Presented): The method of claim 1 wherein the nucleic acid binding portion is a quaternary phosphonium group and the R groups each contain from 1-20 carbon atoms.

5. (Original): The method of claim 4 wherein each R group of the solid phase is a butyl group.

6. (Original): The method of claim 1 wherein the solid support portion is selected from particles, microparticles and beads.

7. (Original): The method of claim 1 wherein the solid support portion comprises an insoluble synthetic polymer.

8. (Original): The method of claim 7 wherein the polymer is selected from polystyrene and polyacrylic polymers.

9. (Original): The method of claim 1 wherein the solid support portion of the solid phase comprises a glass matrix.

10. (Original): The method of claim 1 wherein the solid support portion of the solid phase comprises a silica matrix.

11. (Original): The method of claim 1 wherein the cleavable linker portion of the solid phase further comprises one or more connecting portions.

12. (Original): The method of claim 1 wherein the solid phase further comprising a magnetically responsive portion.

13. (Original): The method of claim 1 wherein the cleavable linker portion of the solid phase is cleaved hydrolytically.

14. (Original): The method of claim 13 wherein the hydrolytic cleavage is performed with a solution that contains a base selected from hydroxide salts and alkoxide salts.

15. (Original): The method of claim 14 wherein the base is selected from LiOH, NaOH, KOH, NH_4OH, $NaOCH_3$, $KOCH_3$, and KOt-Bu.

16. (Original): The method of claim 14 wherein the hydrolytic cleavage is performed with a solution that also contains hydrogen peroxide.

17. (Original): The method of claim 13 wherein the hydrolytic cleavage is performed with a solution that contains a mineral acid.

18. (Original): The method of claim 13 wherein the hydrolytically cleavable linker portion of the solid phase is an ester or thioester group.

19. (Original): The method of claim 1 wherein the cleavable linker portion of the solid phase is cleaved reductively.

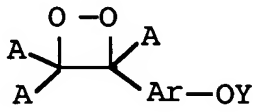
20. (Original): The method of claim 19 wherein the cleavable linker comprises a disulfide or peroxide group.

21. (Original): The method of claim 19 wherein the reductive cleavage is performed with a reducing agent selected from thiols, amines and phosphines.

22. (Original): The method of claim 21 wherein the reducing agent is selected from ethanethiol, 2-mercaptoethanol, dithiothreitol, a trialkylamine and triphenylphosphine.

23. (Original): The method of claim 1 wherein the cleavable linker portion of the solid phase comprises a triggerable dioxetane ring which is cleaved by a triggering agent.

24. (Original): The method of claim 23 wherein the triggerable dioxetane has the formula



wherein the groups A represent stabilizing substituents. selected from alkyl, cycloalkyl, polycycloalkyl, polycycloalkenyl, aryl, aryloxy and alkoxy groups, Ar represents an aryl ring group which can contain additional substituents selected from halogens, alkoxy and amine groups, Y is a group or atom which is removable by a trigering agent selected from chemical agents and enzymes to cause fragmentation of the dioxetane ring.

25. (Original): The method of claim 24 wherein the OY group is selected from OH, $OSiR^3_3$, wherein R^3 is selected from alkyl and aryl groups, carboxyl groups, phosphate salts, sulfate salts, and glycoside groups.

26. (Original): The method of claim 24 wherein Ar in the triggerable dioxetane is a substituted or unsubstituted phenyl or naphthyl group.

27. (Original): The method of claim 23 wherein the triggering agent is selected from bases, fluoride ion, an esterase, a phosphatase, a sulfatase, and a glycosidase.

28. (Original): The method of claim 1 wherein the cleavable linker portion of the solid phase comprises an electron rich alkene which is cleaved by conversion to a thermally unstable dioxetane.

29. (Original): The method of claim 28 wherein the alkene is converted to the unstable dioxetane by reaction with singlet oxygen.

30. (Original): The method of claim 1 wherein the cleavable linker portion of the solid phase is cleaved enzymatically.

31. (Original): The method of claim 30 wherein the cleavable linker portion of the solid phase comprises an acridan ketene dithioacetal which is cleaved by reaction with a peroxidase and a peroxide.

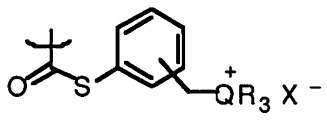
32. (Original): The method of claim 30 wherein the cleavable linker portion of the solid phase comprises an ester which is cleaved by a hydrolase enzyme or an esterase enzyme.

33. (Original): The method of claim 30 wherein the cleavable linker portion of the solid phase comprises an amide which is cleaved by a protease enzyme.

34. (Original): The method of claim 30 wherein the cleavable linker portion of the solid phase comprises a peptide which is cleaved by a peptidase enzyme.

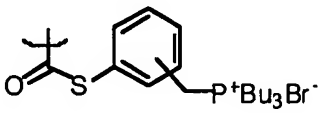
35. (Original): The method of claim 30 wherein the cleavable linker portion of the solid phase comprises a glycoside which is cleaved by a glycosidase enzyme.

36. (Original): The method of claim 13 wherein the cleavable linker portion of the solid phase comprises a thioester having the formula:



wherein Q is P or N and R is alkyl of 1-20 carbons.

37. (Original): The method of claim 36 wherein the cleavable linker portion of the solid phase comprises a thioester having the formula:

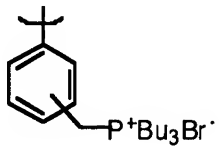


38. (Original): The method of claim 1 wherein the cleavable linker portion of the solid phase is an alkylene group of at least one carbon atom bonded to a trialkylphosphonium or triarylphosphonium nucleic acid binding portion and is cleavable by means of a Wittig reaction with a ketone or aldehyde.

39. (Original): The method of claim 38 wherein the Wittig reaction forms an ylide by deprotonation with an alkoxide salt or hydride salt base in an aprotic organic solvent and the ylide reacts with a carbonyl compound selected from aliphatic and aromatic aldehydes and aliphatic and aromatic ketones.

40. (Original): The method of claim 39 wherein the solvents is selected from THF, diethyl ether, p-dioxane, DMF and DMSO and the carbonyl compound for reaction with the ylide is acetone.

41. (Original): The method of claim 38 wherein the cleavable linker portion of the solid phase has the formula



42. (Previously Presented): The method of claim 1 wherein the cleaving and releasing steps are performed as sequential steps using separate and distinct solutions to accomplish each step.

43. (Previously Presented): The method of claim 1 wherein the cleaving and releasing steps can be performed together in the same step.

44. (Original): The method of claim 2 further comprising, after step (b), washing the solid phase having captured nucleic acid bound thereto with a wash solution to remove other components of the sample from the solid phase.

45. (Original): The method of claim 1 wherein the step of separating the sample from the solid phase is accomplished by magnetic separation.

46. (Original): The method of claim 1 wherein the step of separating the sample from the solid phase is accomplished by a process selected from filtration, gravitational settling, decantation, centrifugation, vacuum aspiration, and overpressure of air.

47. (Previously Presented): The method of claim 1 wherein the nucleic acid binding portion of the solid phase is a ternary sulfonium group of the formula $SR_2^+ X^-$ where R is selected from C_1-C_{20} alkyl, aralkyl and aryl groups, and wherein X is an anion.

48. (Original): The method of claim 1 further comprising:

releasing the nucleic acid from the solid phase in step (e) into a solution; and

f) using the solution containing the released nucleic acid directly in a downstream process.

49. (Original): The method of claim 2 further comprising:

releasing the nucleic acid from the solid phase in step (e) into a solution; and

f) using the solution containing the released nucleic acid directly in a downstream process.

50. (Previously Presented): The method of claim 48 wherein the solution containing the released nucleic acid is used directly in a nucleic acid amplification reaction whereby the amount of the nucleic acid or a segment thereof is amplified using a polymerase or ligase-mediated reaction.